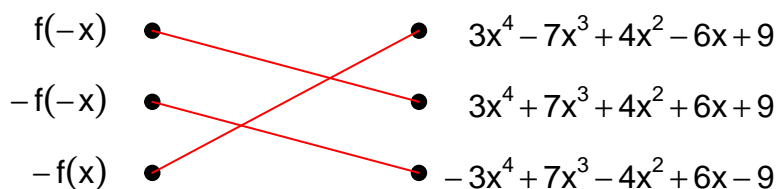# Exam: Function Reflections (Solution version 19)

1. Let function f be defined by the polynomial below:

$$f(x) \; = \; -3x^4 - 7x^3 - 4x^2 - 6x - 9$$

Draw lines that match each function reflection with its polynomial:

Reflections	Polynomials

$f(-x)$ ●　　　　　　　● $3x^4 - 7x^3 + 4x^2 - 6x + 9$

$-f(-x)$ ●　　　　　　● $3x^4 + 7x^3 + 4x^2 + 6x + 9$

$-f(x)$ ●　　　　　　● $-3x^4 + 7x^3 - 4x^2 + 6x - 9$

2. In each xy plane shown below, a function is graphed with blue. Draw the indicated reflections (as a second curve, indicated in legend) with black (or with whatever you have). The x axis is horizontal and the y axis is vertical (as typical), and the scale is equal on both axes.

- $y = g(x)$
- $y = -g(-x)$

- $y = h(x)$
- $y = -h(x)$

- $y = m(x)$
- $y = m^{-1}(x)$

- $y = p(x)$
- $y = p(-x)$
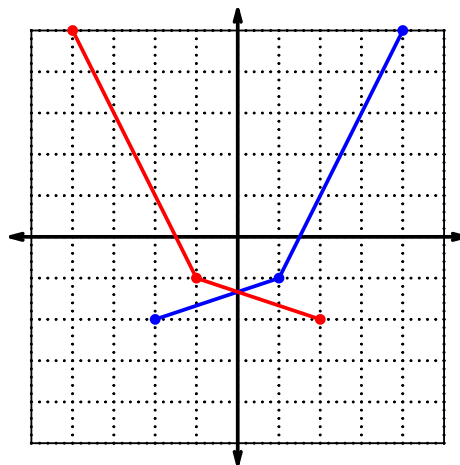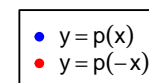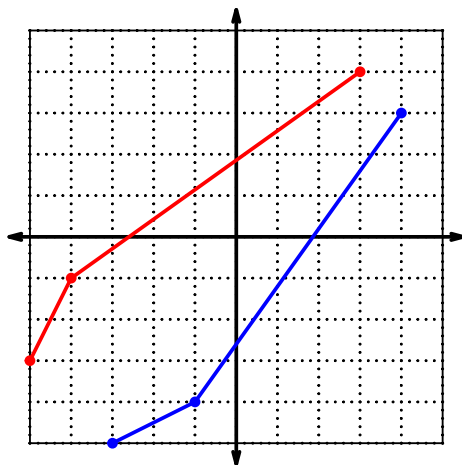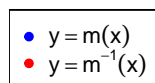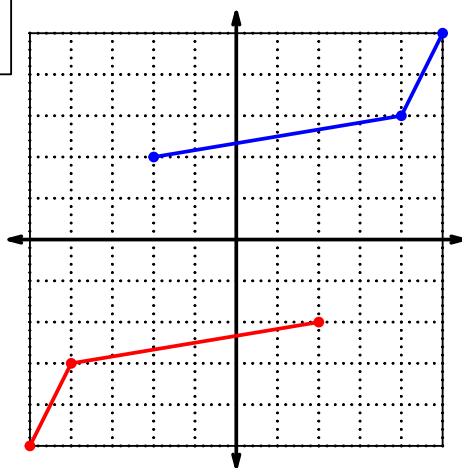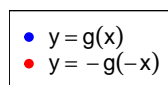
Exam: Function Reflections (Solution version 19)

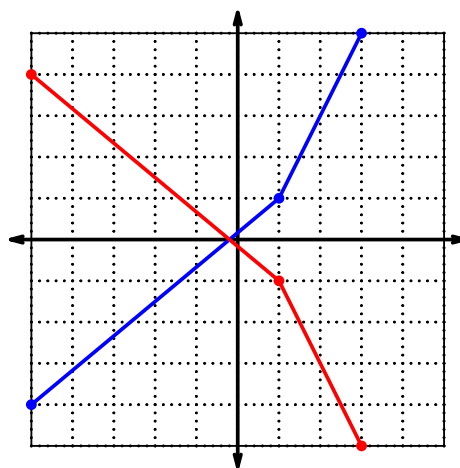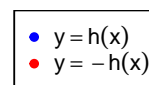For all questions on this page, the functions f, g, and h are defined by the table below.

x	$f(x)$	$g(x)$	$h(x)$
1	9	5	6
2	1	9	4
3	7	2	1
4	5	7	3
5	2	4	7
6	3	8	9
7	8	1	2
8	6	6	5
9	4	3	8

3. Evaluate $h(3)$.

$$h(3) = 1$$

4. Evaluate $f^{-1}(4)$.

$$f^{-1}(4) = 9$$

5. By filling more rows of the table, it is possible to make function f **even**. If that were done, what would be the value of $f(-8)$?

If function f is even, then
$$f(-8) = 6$$

6. By filling more rows of the table, it is possible to make function g **odd**. If that were done, what would be the value of $g(-7)$?

If function g is odd, then
$$g(-7) = -1$$

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7. A function, f, is **even** if $f(x) = f(-x)$ for all x in the domain. A function, g, is **odd** if $g(x) = -g(-x)$ for all x in the domain.

Let polynomial p be defined with the following equation:

$$p(x) \ = \ x^2 - 1$$

a. Express $p(-x)$ as a polynomial in standard form.

$$p(-x) \ = \ (-x)^2 - 1$$
$$p(-x) \ = \ x^2 - 1$$

b. Express $-p(-x)$ as a polynomial in standard form.

$$-p(-x) \ = \ -\left(x^2 - 1\right)$$
$$-p(-x) \ = \ -x^2 + 1$$

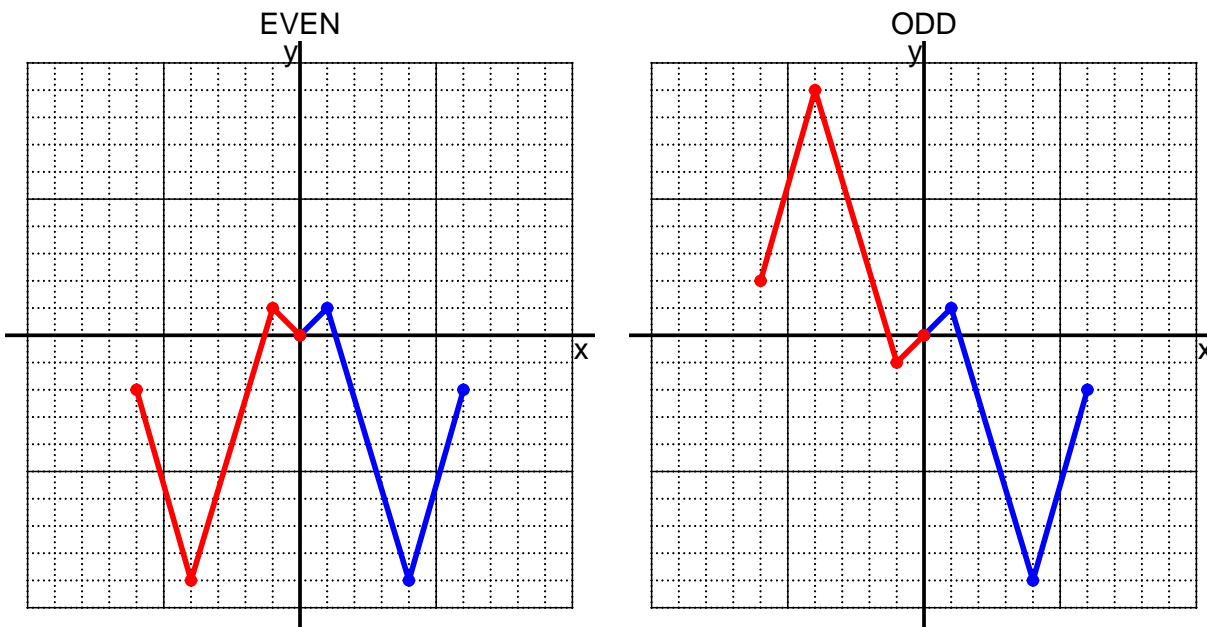c. Is polynomial p even, odd, or neither?

even

d. Explain how you know the answer to part c.

We see that $p(x) = p(-x)$ for all x because $p(x)$ and $p(-x)$ are equivalent polynomials. Thus function p satisfies the criterion for being an even function.

Exam: Function Reflections (Solution version 19)

8. I have drawn half of a function. Draw the other half to make it even or odd.

EVEN

ODD

9. Let function f be defined with the equation below.

$$f(x) = 9(x - 2)$$

a. Evaluate $f(10)$.

step 1: subtract 2
step 2: multiply by 9

$$f(10) = 9((10) - 2)$$
$$f(10) = 72$$

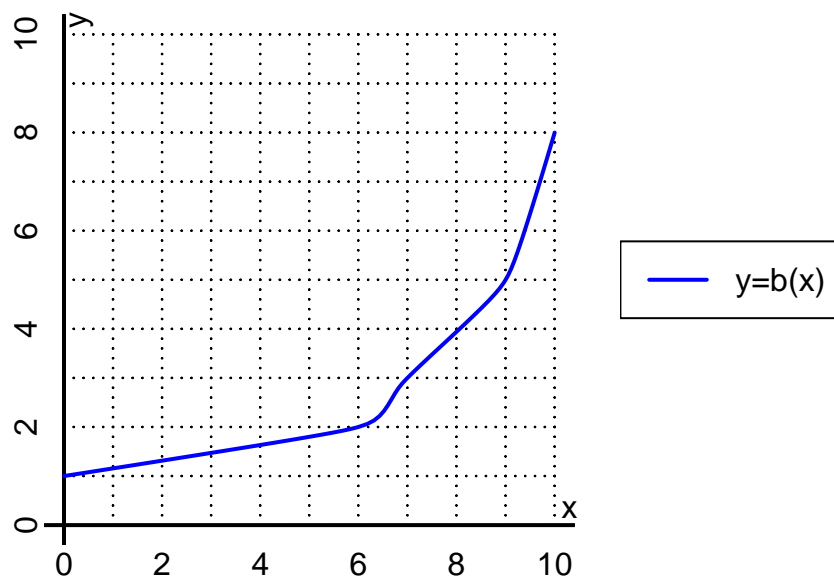b. Evaluate $f^{-1}(36)$.

step 1: divide by 9
step 2: add 2

$$f^{-1}(x) = \frac{x}{9} + 2$$
$$f^{-1}(36) = \frac{(36)}{9} + 2$$
$$f^{-1}(36) = 6$$

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10. The function b is represented by the curve $y = b(x)$ graphed below.

a. Evaluate $b(7)$.

$$b(7) = 3$$

b. Evaluate $b^{-1}(2)$.

$$b^{-1}(2) = 6$$

Exam: Function Reflections (Solution version 19)

11. Function f is defined by the table below.

    a. Complete the columns for $-f(x)$ and $f(-x)$ and $-f(-x)$.

x	$f(x)$	$-f(x)$	$f(-x)$	$-f(-x)$
-2	5	-5	-5	5
-1	-3	3	3	-3
0	0	0	0	0
1	3	-3	-3	3
2	-5	5	5	-5

b. Is function f even, odd, or neither?

odd

c. How do you know the answer to part b?

Function f is odd because column $-f(-x)$ matches column $f(x)$ exactly.